Spring 4-22-2021

Optical Dilatometry Measurements for the Quantification of Sustainable Aviation Fuel Materials Compatibility

Shane Kosir
University of Dayton, kosirs1@udayton.edu

Optical Dilatometry Measurements for the Quantification of Sustainable Aviation Fuel Materials Compatibility

Presented by: *Shane Kosir* - Department of Chemical and Materials Engineering
Adviser: *Dr. Joshua Heyne* - Department of Mechanical and Aerospace Engineering

University of Dayton

University of Dayton HEAT Lab

Research Objective: To develop methods to screen candidate sustainable aviation fuel (SAF) materials compatibility at an early stage of the approval process.

Motivation

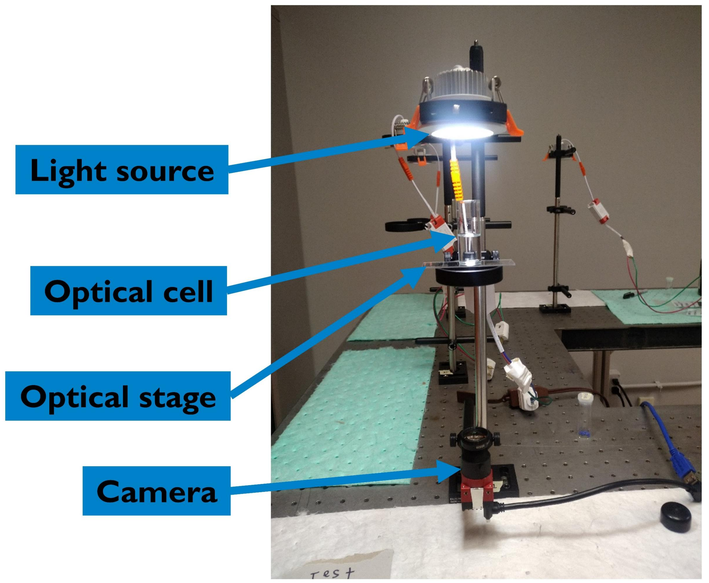
- SAFs offer a near-term opportunity to reduce aviation's greenhouse gas emissions[1]
- Currently approved SAFs are not 100% drop-in, largely due to materials compatibility issues[2]

UN Sustainable Development Goals

- **7.A** Facilitate access to clean energy research and technology...
- **12.2** By 2030, achieve the sustainable management and efficient use of natural resources.

Methodology

- O-ring volume swell was measured with optical dilatometers
- Volume swell data was coupled with GCxGC[3] to predict volume swell



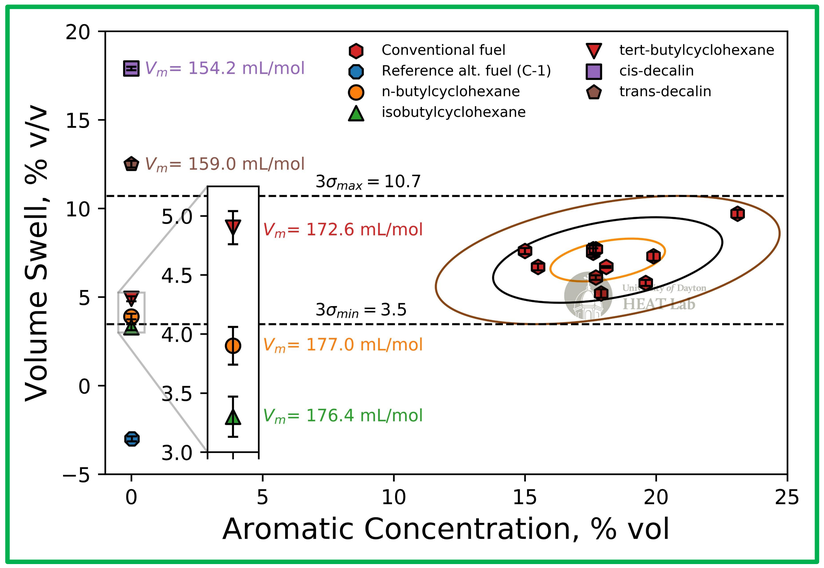
Optical dilatometer used in this study

References

1. Jong S et al., "Life-cycle analysis of greenhouse gas emissions from renewable jet fuel production", *Biotechnology for Biofuels*, vol. 10, 2017.
2. ASTM D7566, ASTM International.
3. Yang Z et al., "A GC×GC Tier α combustor operability prescreening method for sustainable aviation fuel candidates", *Fuel*, vol. 292, 2021.

Results

- A neural network predicted volume swell with a mean absolute error of 30% of the mean value
- High-swelling compounds may affect predictions



Conclusions & Next Steps

- Model developed to predict swell from GCxGC species-class concentration measurements with <1mL of fuel
- Add to swell/GCxGC training set to improve model accuracy